DEVELOPMENT OF FIXTURE TO REDUCE THE CYCLE TIME OF C-8 GRIDING MACHINE

Vaibhav Ingle[1] , L P Raut[2], Sandesh Potnis[3]
[1] *Student, BE 4th Year Mechanical Engineering, GHRCE, Nagpur, India.*
[2]*Assistant Professor, Department of Mechanical Engineering, GHRCE, Nagpur, India.*
[3]*General Manager (Improvement Head), NRB Industrial Bearings, Aurangabad, India.*

ABSTRACT

"*What a difference a second makes****"*** *– a quote from an empowered employee. Just one second over a ten second continuous cycle can mean your line runs consistently 10% faster, the difference between comfortably achieving tight production schedules or continually being capacity constrained.**[1]** This work presents a new approach for the reduction of process cycle time and its impact on a company's competitive edge. Reduction in cycle time has been gaining significant attention in recent times. The shorter cycle times effect in higher consumer satisfaction, lower manufacturing rate, higher yield, and better potential given tool inventory and facility constraints. This research paper provides a brief review of core approaches related to cycle time and also describes a methodology for cycle time reduction in any manufacturing and automobile production industry. It includes the assessment and potential gains of the projected cycle time reduction methodology.[3*]

Keyword:- *Taper, Ovality*

---

1. INTRODUCTION

In the present scenario of globalization and aggressive market, one of the most significant aspects for manufacturing units is to be competent of producing a generous range of products for very high demand. Requirements at very high rate and capabilities to fulfil the same looks for manufacturers that have the production capabilities at abundant level. Manufacturing industries with this fabrication power are in continuous struggle to race with their competitors. The manufacturing firms are performing such abilities to be on peak of the sell, by manufacturing value able goods at viable prices and it have become one of the main challenges for fabrication manufacturing processes.

Manufacturing Time based challenge is an organized way focusing on reduction of total throughput time in manufacturing firm. Reduce time has a cascading influence on value and worth. As cycle times are reduced, output increases equally. If reduction in cycle time is fifty percent and work in process inventory is twice turns causes output to increase from twenty to seventy percent. As output increases, resource capacity is freed. Two major effects take place: expenses turn down, and the manufacturing firm becomes capable of producing considerably more output with fewer assets: a successful arrangement.

The majority of manufacturing industry expend anywhere from 6-11 percent total time truly adding value to the manufactured goods, i.e., transforming the component or moving it nearer to the consumer. The remaining of the time is waste, resulting in high costs going on with loss of time. Entering velocity all through a manufacturing industry has a reflective effect on time and cost. The necessity for non value-adding functions disappears, and the functions planned to put up exceptional situation go down. The Manufacturing firm chart becomes flat. Following this is a remarkable reduction of operating cost. [3]

Figure 1: C8 Boring grinding machine

2. LITERATURE REVIEW

2.1 Cycle Time

The time required at each station for the performance of the work is known as cycle time. Cycle time is normally larger than the service time. The cycle time at a station is the time interval between the completion or the starting of work on successive items, and, therefore includes both productive and non productive work as well as any idle time. [3]

Figure 2: Cycle Time

Cycle time = Service time + Idle time

The cycle time depends on the total output required and the available time for production
Suppose T = Useful production time available per day
and

Q = Daily output required in number of units

$$\text{Cycle time } C = \frac{\text{Useful Production Time Per Day}}{\text{Output Per Day}}$$

2.2 Methods to improve cycle time

1. Reduce WIP
1.1 Decrease input until WIP drops to desired value.
1.2 Increased line speed (the number of moves or turns per day) until WIP drops to desired value
a. Adding labour
b. Adding overtime
c. Reducing wasted time

2. Reduce the number of process steps
3. Reduce the lot size.
4. Reduce non value added operations like working on control wafers, measurements, unnecessary meetings, etc.
5. Fine tuning. [3]

PROBLEM IDENTIFICATION

NATV washers are generally used in NATV Stud Bearings as seal. When operation was done on NATV washer, loading and unloading was time consuming. Previously operation was done on single washer. It was hold directly in the chuck. Again it was time consuming and prone to accidents. So idea of using fixture came in mind, so we made fixture for five washers and take trial for a batch of washer. For five washer there were taper and ovality problem occurred.

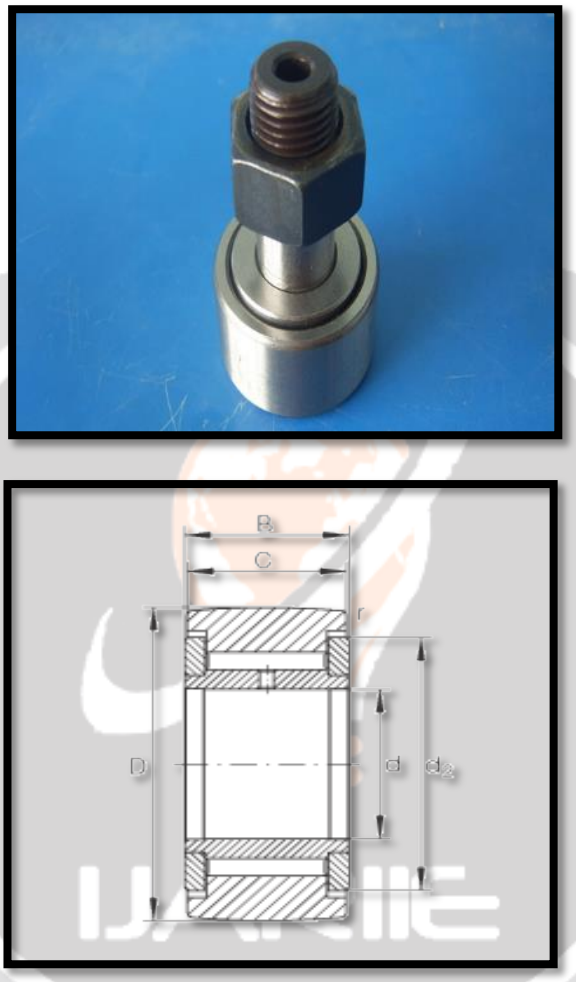

Figure 3: NATV bearing with CAD Drawing

Initially while manual uploading it would take much time for setting of jaws. Operator need extra time to grind the jaws thus increases in time approximately 2 hrs. After setting, loading was done manually so it also takes time to fixed washers properly in the jaws. After grinding operation while unloading there was tilting problem of washer in the jaws. So that cycle time increase approximately by 60 seconds.

This will cause

1) Bearing will generate noise while working.
2) There will be rotation problem. Bearing will not rotate properly and thus will cause vibrations.
3) There will irregular contact between needle and washer.
4) Life of bearing is reduced.

Taper :- Taper means, a conical surface by gradual reduction or increase in diameter from a cylindrical work piece.

Ovality :- Ovality or non circularity is the degree of deviation from perfect circularity of the cross section of the core. In measurements, ovality is the amount of out-of-roundness of a hole or cylindrical part in the typical form of an oval.

CYCLE TIME REDUCTION

The study was carried out on C-8 machine. Bore Grinding Operation is performed on it. Various sizes of jobs are processed on this machine so cycle time varies according to job. The study was carried out on six jobs and cycle time was calculated. As this machine is very old and fully mechanical type there were very less chances to make changes in machine to reduce cycle time. So we opted to make changes in turning drawing. We also suggested new loading and unloading technique to minimize the cycle time.

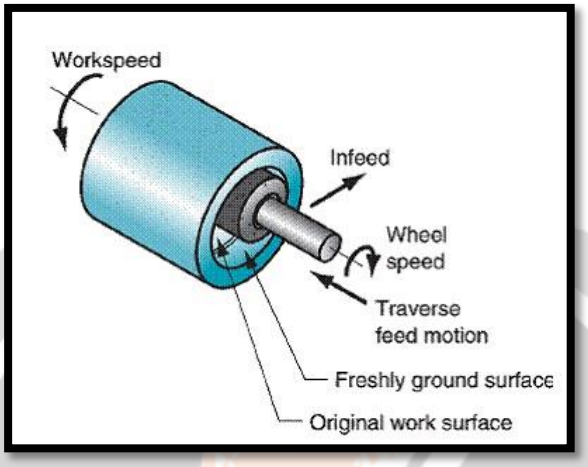

Figure 4: Bore Grinding Operation

FIXTURE

As stated above, the other ideas of loading and unloading technique and turning drawing didn't help much in reducing the cycle time to more extent of NATV washer. And more over by using above techniques the problem of ovality and taper started arising. So we wanted to find other technique and idea of use a fixture came to mind.

Fixture is a work holding or support device used in manufacturing industry. Fixtures are used to securely locate (position in a specific location) and support the work, insuring that all parts produced using the fixture will maintain conformity and interchange ability. Using the fixture improves the economy of production by allowing smooth operation and quick transition from part to part, reducing the requirement for skilled labour by simplifying how work piece are mounted and increasing conformity across the production run. The fixture's primary purpose is to create a secure mounting point for a work piece allowing for support during operation and increased accuracy, precision, reliability and interchange ability in the finished parts. It also serves to reduce working time by allowing quick setup and by smoothing the transition from part to part.

Fig. No. 5:- Assembly And Dismantling Of Fixture

Previously the trials were taken by clamping **five** washers at a time directly into the chuck. But it would take too much time for loading and unloading and was proned to accident. Operator has to put hand to load or unload the washers and it would come very closely to the grinding wheel rotating at very high speed. Also due to small size of washer it would become very slippery to handle the washer while loading and unloading and would cost extra time.

Initially we made fixture for **five** washers but there was taper and ovality problem occurred. So we reduced the washer from **five to four** and checked out for taper and ovality. So the value of taper and ovality was reduced as compared to **five** washers but still it was not in the range of tolerance. So to get within tolerance value of taper and ovality, we made fixture for **three** washer and checked the result. The result was within tolerance limits.

Before using fixture cycle time
Manual time (loading + unloading) = 52 seconds.
Machining time = 48 seconds.
Total cycle time = 1 min 40 seconds**.**

After using fixture
Manual time (loading + unloading) = 11 seconds.
Machining time = 48 seconds.
Total cycle time = 59 seconds.

CONCLUSION

This paper presented a research work on reduction in process cycle time in manufacturing industry. After changing the grinding allowance to ±0.05mm, the cycle was reduced by 2 to 3 seconds.
One important point about productivity that one should remember that simply reducing cycle time will not improve productivity. There has to be an accompanying change in staffing or increase in output for productivity to improve**.**

REFERENCES

1. Shailesh S.Pachbhai1, Laukik P.Raut, 'A Review on Design of Fixtures, International Journal of Engineering Research and General Science Volume 2, Issue 2, Feb-Mar 2014, ISSN 2091-2730, pp 126-146.
2. Shrikant Peshatwar, Laukik P. Raut, ' Design and Development of Fixture for eccentric shaft: A Review', International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622, Vol. 3, Issue 1, January -February 2013, pp.1591-1596.
3. Shailesh S Pachbhai1* and Laukik P Raut, 'Design and development of hydraulic fixture for machining hydraulic lift housing' , International journal of Mechanical Engineering and robotics research, ISSN 2278 – 0149, Vol. 3, No. 3, July, 2014,
4. Mushtaq Patel, Praveen Singh Sisodiya, Sajid Qureshi, Dr. Vivek Bansod," Reduction in Process Cycle Time in Mechanical Production Industries by Using Eight Core Approaches", 2014 IJEDR | Volume 2, Issue 1 | ISSN: 2321-9939
5. Sameet Dandawate, Laukik P. Raut, "Implementing '5-S Methodology' as Tool for Improving Efficiency & Performance of Delivery and Production Operations at Bajaj Steels", IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 03, 2015 | ISSN (online): 2321-0613.
6. Rajat P. Kale, Laukik P. Raut, "Kaizen & Its Applications – A Japanese Terminology Referred to Continuous Improvement", IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 02, 2015 | ISSN (online): 2321-0613
7. Rajat B. Wakode, Laukik P. Raut, "Overview on Kanban Methodology and its Implementation", IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 02, 2015 | ISSN (online): 2321-0613.
8. Pratik P. Kulkarni, Laukik P. Raut, "Just In Time Manufacturing: A conceptual survey & IT's Application in 'Bajaj Steels Ltd.' Nagpur", International Journal of Research in Advent Technology, Vol.3, No.2, February 2015 E-ISSN: 2321-9637.

9. Arpit S. Bhoyar, Laukik P. Raut, Sunil Mane, 'Total Productive Maintenance: The Evolution in Maintenance and Efficiency', Int. Journal of Engineering Research and Application, ISSN: 2248-9622, Vol. 7, Issue 11, (Part -I) November2017, pp.26-32.
10. Sumit P. Raut, Laukik P. Raut, 'Implementing Total Quality Management to Improve Facilities and Resources of Departments in Engineering Institute', Int. Journal of Engineering Research and Applications, ISSN : 2248-9622, Vol. 4, Issue 1(Version 2), January 2014, pp.342-349